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ORIGINAL STUDIES

- Simplified Formula for the Calculation of Mitral Valve Area: Potential Inaccuracies in Patients With Tachycardia**, Walter C. Brogan III, Richard A. Lange, and L. David Hillis 81
- Angioplasty of Long or Tandem Coronary Artery Lesions Using a New Longer Balloon Dilatation Catheter: A Comparative Study**, James F. Brymer, Fareed Khaja, and Phillip L. Kraft 84
- Rapid Thrombus Dissolution by Continuous Infusion of Urokinase Through an Intracoronary Perfusion Wire Prior to and Following PTCA: Results in Native Coronaries and Patent Saphenous Vein Grafts**, Anthony T. Chapekis, Barry S. George, and Richard J. Candela 89
- Coronary Angioplasty Using New 6 French Guiding Catheters**, Robert Feldman, Eric Glemser, Judy Kaizer, and Mary Standley 93
- Reduction in Injection Pain Using Buffered Lidocaine as a Local Anesthetic Before Cardiac Catheterization**, Peter Sapin, Regina Petrozzi, and Gregory J. Dehmer 100
- Coronary Arteriography in Patients With Dextrocardia**, James C. Blankenship and José Antonio F. Ramirez 103

CASE REPORTS

- Accordion Effect in Tortuous Right Coronary Arteries During Percutaneous Transluminal Coronary Angioplasty**, R. Andrew Rauh, Robert W. Ninneman, David Joseph, Vinod K. Gupta, Dale G. Senior, and William P. Miller 107
- Accordion Right Coronary Artery: An Unusual Complication of PTCA Guidewire Entrapment**, Ubeydullah Deligonul, Satyanarayana Tatineni, Randy Johnson, and Morton J. Kern 111
- Subacute Bilateral Coronary Ostial Stenoses Following Cardiac Catheterization and PTCA**, Vance E. Wilson and Eric R. Bates 114
- Lack of Evidence for Small Vessel Disease in a Patient With "Slow Dye Progression" in the Coronary Arteries**, Johan Van Lierde, Matty Vrolix, Dimitris Sionis, Hilaire De Geest, and Jan Piessens . . 117
- Coronary Artery Narrowing Due to Extrinsic Compression by Myocardial Abscess**, Cindy L. Wickline, Vasu D. Goli, and James C. Buell 121
- Coronary Focal Ectasia Formation Following Percutaneous Transluminal Angioplasty**, Herbert J. Semler 124
- Successful Angioplasty of a Chronically Occluded Saphenous Vein Graft Using a Prolonged Urokinase Infusion From the Brachial Route**, Andrew J. Doorey, Mark A. Rosenbloom, and Mark R. Zolnick 127
- Case Report of a Coronary Anomaly: Crossing Obtuse Marginal Arteries**, Seth D. Bilazarian, Alice K. Jacobs, James D. Fonger, and David P. Faxon 130
- Multiple Coronary Artery-Left Ventricular Fistulae: Clinical, Angiographic, and Pathologic Findings**, Ian W. Black, Christine K.C. Loo, and Roger M. Allan 133
- Congestive Heart Failure Secondary to an Arteriovenous Fistula From Cardiac Catheterization and Angioplasty**, Alexander O. Sy and Stephen Plantholt 136
- "End-Hole" Pigtail Catheter: An Unusual Complication of Left Ventriculography**, Thomas C. Hilton, Ubeydullah Deligonul, Frank Aguirre, and Morton J. Kern 139
- In Vivo Thrombus Formation on a Guidewire During Intravascular Ultrasound Imaging: Evidence for Inadequate Heparinization**, Paul A. Grayburn, John E. Willard, M. Elizabeth Brickner, and Eric J. Eichhorn 141

BASIC INVESTIGATION

- Effects of Intracoronary Administration of Contrast Media on Coronary Hemodynamics in a Canine Post Ischemic Reperfusion Model**, Sheng H. Sheu, Ming H. Hwang, Zhen E. Piao, Robert J. Hariman, Henry S. Loeb, and Patrick J. Scanlon 144

LETTERS TO THE EDITOR

- Pseudoaneurysm Following Balloon Angioplasty?** P. Syamasundar Rao 150
- Pseudoaneurysm Formation Following Balloon Angioplasty for Recurrent Coarctation of the Aorta: Reply**, Douglas H. Joyce and Lynn B. McGrath 151
- A Simplified Approach to Cineangiogram Labeling**, Abraham A. Embi, Lisa Anseeuw, and Dean H. Roller 152

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Coronary Angioplasty Using New 6 French Guiding Catheters

Robert Feldman MD, Eric Glemser BSN, Judy Kaizer RN, and Mary Standley BS

Coronary angioplasty (PTCA) was performed with specially constructed 6-French guiding catheters with an internal lumen of 0.051 inches. In 154 patients these guiding catheters were used in a variety of configurations in conjunction with miniature balloon-on-a-wire dilatation catheters in 1.5 to 3.5 mm sizes to perform PTCA.

Overall patient success was 94%. PTCA was attempted in 24 totally occluded arteries with a success rate of 83% and 174 stenoses with a success rate of 97%. 6 French guiding catheters can be used to successfully perform PTCA.

Key words: coronary artery disease, coronary revascularization, ischemic heart disease, coronary angioplasty

INTRODUCTION

One avenue in which percutaneous transluminal coronary angioplasty (PTCA) technology is rapidly advancing is in the miniaturization of equipment, particularly balloon-on-a-wire dilatation system catheters. These miniature PTCA balloons are currently available from 3 manufacturers (Cordis ORIONTM, Cordis Corp., Miami, FL; Sci-Med ACETM, Sci-Med Life Systems, Inc., Minneapolis, MN; and USCI PROBETM, C.R. Bard, Inc., USCI Division, Billerica, MA) in balloon sizes from 1.5 through 3.5 mm and have balloon profiles in the 0.020–0.036 inch range (Table I). The shaft size of these balloon-on-a-wire dilatation catheters is 1.7–2.4 French (approximately 0.6–0.8 mm or 0.023–0.032 inches). In addition, a 1.5 mm Dilating Guidewire (.018 inches, Sci-Med) which can be used alone or placed through some over-the-wire balloons is also available.

Because of their small catheter size these PTCA balloon dilatation systems can be used with smaller-sized guiding catheters than the larger conventional over-the-wire PTCA balloons. In fact, anecdotal and several case reports have documented use of the USCI PROBE balloon catheter with diagnostic catheters as small as 5 French [1–6]. The 2.0 mm balloon sizes (ACE or PROBE) can work reasonably well through uncoated, tapered diagnostic catheters if considerable catheter manipulation is not necessary in the target vessel. However, in our experience, balloons larger than the 2.0 mm size move poorly if at all through a diagnostic catheter. This poor movement becomes particularly apparent as the balloon exits or returns to the preformed curve of the diagnostic catheter turned "guide." Any winging of the PTCA balloon after it has been inflated either during

preparation or during dilatation adds to the difficulty in movement through a diagnostic catheter [4]. This paper describes our present experience using 6 French custom-made guiding catheters and miniature PTCA balloons in a range of clinical circumstances.

MATERIALS AND METHODS

The guiding catheters were constructed in conjunction with Cordis Corporation. The catheters are similar to the 6 French Super TorqueTM diagnostic catheter, but differ in several important features. First, they are untapered in both their outer and internal diameter (.051 inches) from the hub to the tip. Second, attached to the distal end is a soft, radiopaque 2 mm extension, which is the Brite TipTM. Third, unlike conventional guiding catheters where to facilitate balloon movement Teflon^R comprises the inner layer, the internal lumen of this catheter is coated with silicone. An illustration showing relative guiding catheter-to-balloon shaft ratios, comparing an 8 French guiding catheter with an over-the-wire balloon and a 6 French guiding catheter with a balloon-on-a-wire is shown in Figure 1.

PTCA was otherwise performed in a standard fashion. A successful PTCA was defined as a residual stenosis

From the Munroe Regional Medical Center, Ocala Heart Institute, Ocala, Florida.

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Address reprint requests to Munroe Regional Medical Center, 131 S.W. 15th Street, Ocala, FL 32671.

TABLE I. Balloon-on-a-wire Dilatation Catheters: Summary of Currently Available Profiles (in inches)

	1.5 mm	2.0 mm	2.5 mm	3.0 mm	3.5 mm
ACE TM	.020	.022	.030	.032	.036
DGW TM	.018	—	—	—	—
ORION TM	—	.028	.028	.030	.032
PROBE ^{TMa}	—	.020	.025	.030	—

^aNot currently available but when released will be available in 1/4 sizings as well.

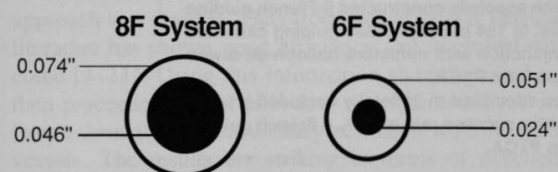


Fig. 1. Proportional comparison of a conventional 8 French guiding catheter with a 3.5 French over-the-wire balloon and the described 6 French guiding catheter with a 1.8 French shaft balloon-on-a-wire.

(<50%) and no in-hospital angina, myocardial infarction, bypass surgery, or death.

RESULTS

PTCA was performed using a 6 French guiding catheter in 154 patients. In 152 patients a 6 French guiding catheter was the initial guiding catheter chosen. In 2 patients an 8 French guiding catheter was tried first. In one of these patients, no conventional 8 French guiding catheter would seat in a small right ostium, but a 6 French JR 4 fit well. In the other patient, both an 8 French JL 4 and an 8 French AL 2, both without side holes, functionally occluded the left main artery; however, a 6 French AL 2 fit without pressure dampening. A femoral approach was used in 144 patients and a percutaneous right or left brachial approach in 10.

Patient diagnosis varied as expected, including silent ischemia in 3 patients, stable angina in 10, unstable angina in 95, evolving acute myocardial infarction in 16, and myocardial infarction within the past 2 weeks in 30. Patient weight averaged 76 kg (range 46 to 133 kg) and body surface area averaged 1.85 m² (range 1.45 to 2.45 m²). The average age was 66 years (range 38 to 85 years), 81 of the patients were male, 73 female.

Complications occurred in 5 patients, in hospital death occurred in 2 patients, myocardial infarction in 2, and coronary bypass surgery before discharge in 4 patients. 1) An 85-year-old woman with refractory unstable angina and severe peripheral vascular disease agreed to PTCA, but declined surgery under any circumstances. PTCA of a subtotal anterior descending using a 6F AL 1

TABLE II. Guiding Catheter Shapes Selected

Shape	LM	LAD	LCX	RCA	DIAG	GRAFT
JL 5	1	—	2	—	—	—
JL 4.5	—	—	5	—	—	—
JL 4	—	34	20	—	2	—
JL 3.5	—	9	—	—	1	—
JL 5	—	—	—	1	—	—
JR 4	—	—	—	36	—	1
JR 3.5	—	—	—	2	—	1
AL 2	—	—	3	—	—	1
AL 1	—	8	11	4	1	—
AR 2	—	—	—	4	—	2
LSVBG	—	—	—	19	—	5
RSVBG	—	—	2 ^a	1	—	4
IMA	—	—	—	2	—	2
Sones	—	1	—	1	—	—

^aCongenitally aberrant arising from right Sinus of Valsalva.

TABLE III. Balloon-on-a-Wire Catheters Used

	1.5 mm	2.0 mm	2.5 mm	3.0 mm	3.5 mm
ACE TM	1	3	2	3	1
ACS Gold ^{TMa}	N/A	—	1	1	N/A
PROBE TM	N/A	17	6	12	N/A
ORION TM	N/A	35	33	46	5

^aInvestigational devices.

— = Not used.

N/A = Not available.

and a 2.5 mm Cordis Orion by the percutaneous left brachial approach was initially technically successful (>90% to 30%). One hour later angina recurred and the anterior descending had occluded. Repeat PTCA was complicated by repeated reocclusion. She died 1 day later having sustained an anterior infarction. 2) A 64-year-old woman presented in cardiogenic shock secondary to an evolving inferior infarction. PTCA using a 6-French JR 4 and a 3.0 mm Cordis Orion was successful in opening the occluded right coronary artery (100% to 10%) and the patient stabilized. Because her left main was narrowed 90%, she underwent coronary bypass surgery 8 days later. Postoperatively she developed adult respiratory distress syndrome and died 11 days after PTCA. 3) A 65-year-old diabetic woman had multivessel PTCA. Her anterior descending (99% to 20%) occluded 24 hours after PTCA and was heralded by recurrent angina, new nonspecific ST-T wave changes; and minimal CPK elevation. Rather than repeat PTCA, she chose bypass surgery which was done 3 days after PTCA. 4) A 63-year-old woman with silent ischemia and restenosis (90%) of a right coronary required emergent bypass. Initial dilatation was through a 6-French left saphenous vein bypass graft guide and a 3.0 mm Orion was used. Because of residual stenosis of 40%, balloon size was increased to 3.5 mm (Orion). The final angiographic result

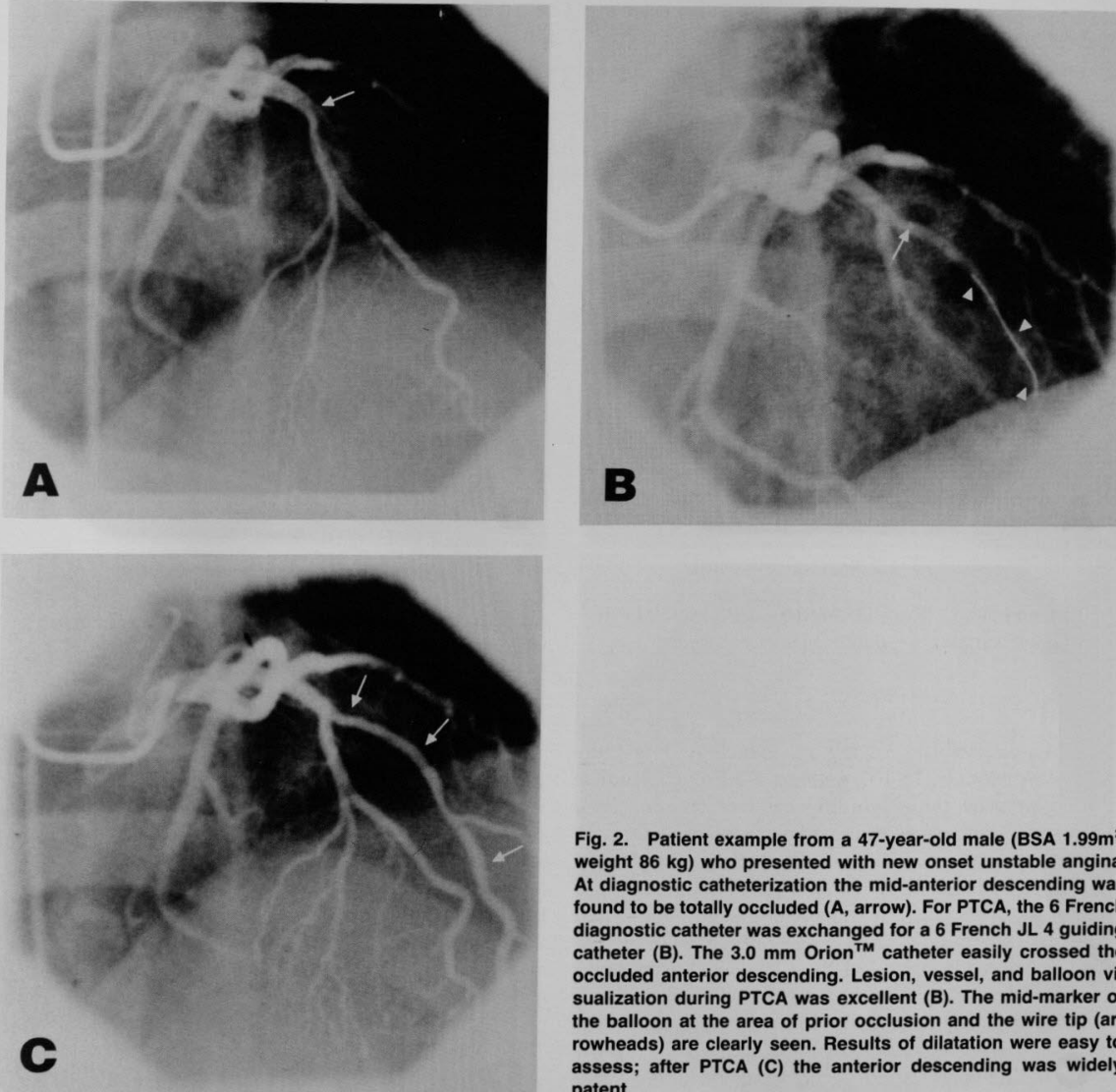


Fig. 2. Patient example from a 47-year-old male (BSA 1.99m², weight 86 kg) who presented with new onset unstable angina. At diagnostic catheterization the mid-anterior descending was found to be totally occluded (A, arrow). For PTCA, the 6 French diagnostic catheter was exchanged for a 6 French JL 4 guiding catheter (B). The 3.0 mm Orion™ catheter easily crossed the occluded anterior descending. Lesion, vessel, and balloon visualization during PTCA was excellent (B). The mid-marker of the balloon at the area of prior occlusion and the wire tip (arrowheads) are clearly seen. Results of dilatation were easy to assess; after PTCA (C) the anterior descending was widely patent.

was excellent (10%) without dissection; but 2 hours later chest pain with transient ST changes occurred. Repeat angiography showed a new extensive partially occlusive dissection. Repeat dilatation with a larger guiding catheter (7-French, Cordis) and use of an ACS Stack Perfusion balloon (ACS, Advanced Cardiovascular Systems Inc., Temecula, California) failed to yield an optimal result and emergency bypass surgery was done. 5) A 66-year-old woman with post-infarction angina was found to have 3-vessel disease including occlusion of the right. PTCA with a 6 French JR 4 guiding catheter and a 3.0 mm Orion resulted in an excellent angiographic re-

sult (< 30%). However repeated, symptomatic reocclusion led to urgent bypass surgery. None of the complications seemed related to choice of initial equipment. Although in each case the stenosis was initially technically successful crossed and dilated, none of these patients or these lesions were counted as successful. No peripheral vascular complications requiring surgery occurred. Two patients had hematomas at the femoral catheterization site which were managed conservatively.

PTCA was successful in 143 of the 152 patients in whom a 6 French guiding catheter was used initially and in both of those in whom an 8 French guiding catheter

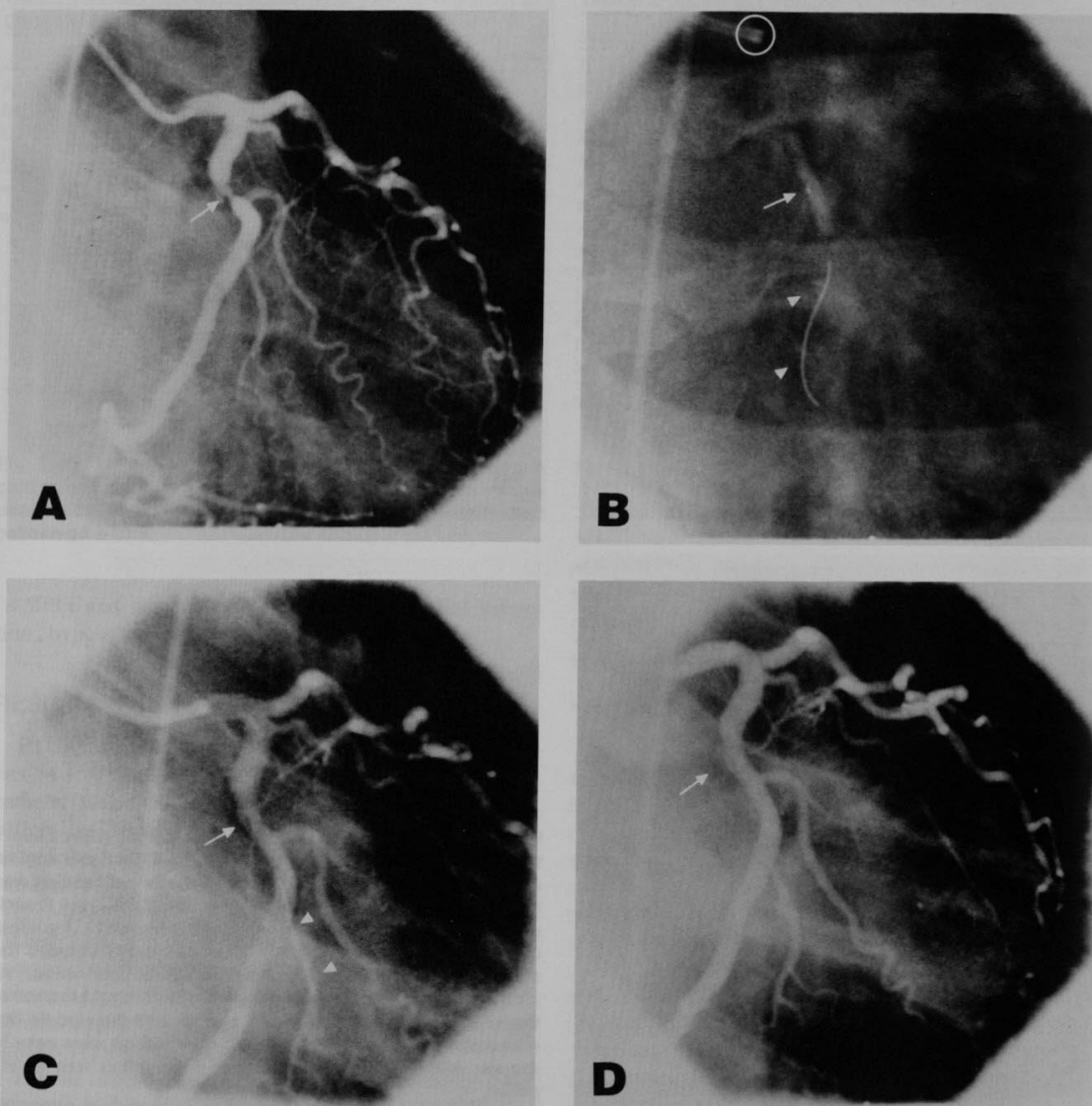


Fig. 3. Patient example from a 62-year-old male (BSA 1.93 m², weight 76 kg) who presented with recent onset unstable angina. The circumflex arises at a sharp angle and has a severe, complex stenosis (A, arrow). Dilatation was performed with a 6

French JL 4.5 guiding catheter and a 3.5-mm Orion catheter. The Brite Tip™ (O), the balloon marker (arrow), wire tip (arrowhead), and stenosis (arrow) were easily visualized during PTCA (B and C). After PTCA (D) the circumflex was widely patent.

had failed first. In order to achieve a successful dilatation a 6 French guiding catheter was changed to a 7 French guiding catheter in 4 patients. In each of these cases the initial 6 French shape chosen fit imperfectly or gave inadequate support. A 7 French guiding catheter of a different shape not available in 6 French was always used; and PTCA was uneventful. We suspect if the same

shape had been available in the 6 French guiding catheter, PTCA would have been successful as well. In 2 patients PTCA was unsuccessful because of inability to cross a recent (2-month-old) total occlusion and a long tortuous subtotal occlusion, both in the right coronary artery. Despite attempts with 8 French guides and a variety of fixed and over-the-wire balloon systems, neither

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